

Aeronautics Committee Report to the NASA Advisory Council



Ms. Marion Blakey (Chair)
July 26, 2012

Committee Information

- **Members:**
 - Ms. Marion Blakey, Chair (Aerospace Industries Association)
 - Mr. John Borghese (Rockwell Collins)
 - Dr. Ilan Kroo (Stanford University)
 - Dr. John Langford (Aurora Flight Sciences)
 - Mr. Mark Anderson (Boeing)
 - Dr. John-Paul Clarke (Georgia Institute of Technology)**
 - Dr. Mike Bragg (University of Illinois)**
 - Mr. Mark Pearson (General Electric)**
 - Dr. Mike Francis (UTRC)**
 - Mr. Tommie Wood (Bell Helicopter)**
 - Gen. Les Lyles (ex-officio – Chair, Aeronautics and Space Engineering Board, National Research Council)
- Plans for next meeting: Face-to-face Committee Meeting at Glenn Research Center, October, 2012.

** New Committee Members

Areas of Interest Explored at Current Meeting

Topics covered at the Aeronautics Committee meeting held on July 24, 2012 at Goddard Space Flight Center:

National Aeronautics Research Agenda

Aeronautics International Partner Engagement

NextGen Research and Development Activities*

Unmanned Aircraft Systems (UAS) Subcommittee Outbrief*

ARMD Education and Public Outreach Activities*

(Joint meeting with NAC Education and Public Outreach Committee)

* This topic has a related finding provided by the Aeronautics Committee



- Objective: Synthesize a National Aeronautics Research Agenda that captures the major needed research thrusts
- Advance ongoing mobility, safety, and energy and environment research focus areas.
 - Support **NextGen**
 - **Safety**
 - **Vehicle efficiency**
 - **Environmental improvements**
 - **Unmanned Aircraft Systems (UAS) in the NAS**
- Take the next steps in advancing supersonic transportation.
 - Demonstrate **low boom supersonic flight** capability as a required precursor to standard setting, regulations and industry innovation.

Research Thrusts

- “Gate-to-Gate” Trajectory Based Operations Simulation and Shadow-Mode Capability
- Low Boom Supersonics Demonstration
- Transformation Enablers
 - Composite Materials and Structures
 - Autonomous and Intelligent Aviation Systems
 - Electric Aircraft Systems Technology
- Complex Systems Engineering
 - Physics-Based Virtual Testing Capability
 - Certification of Safety Critical Complex Systems

Challenges / Next Steps

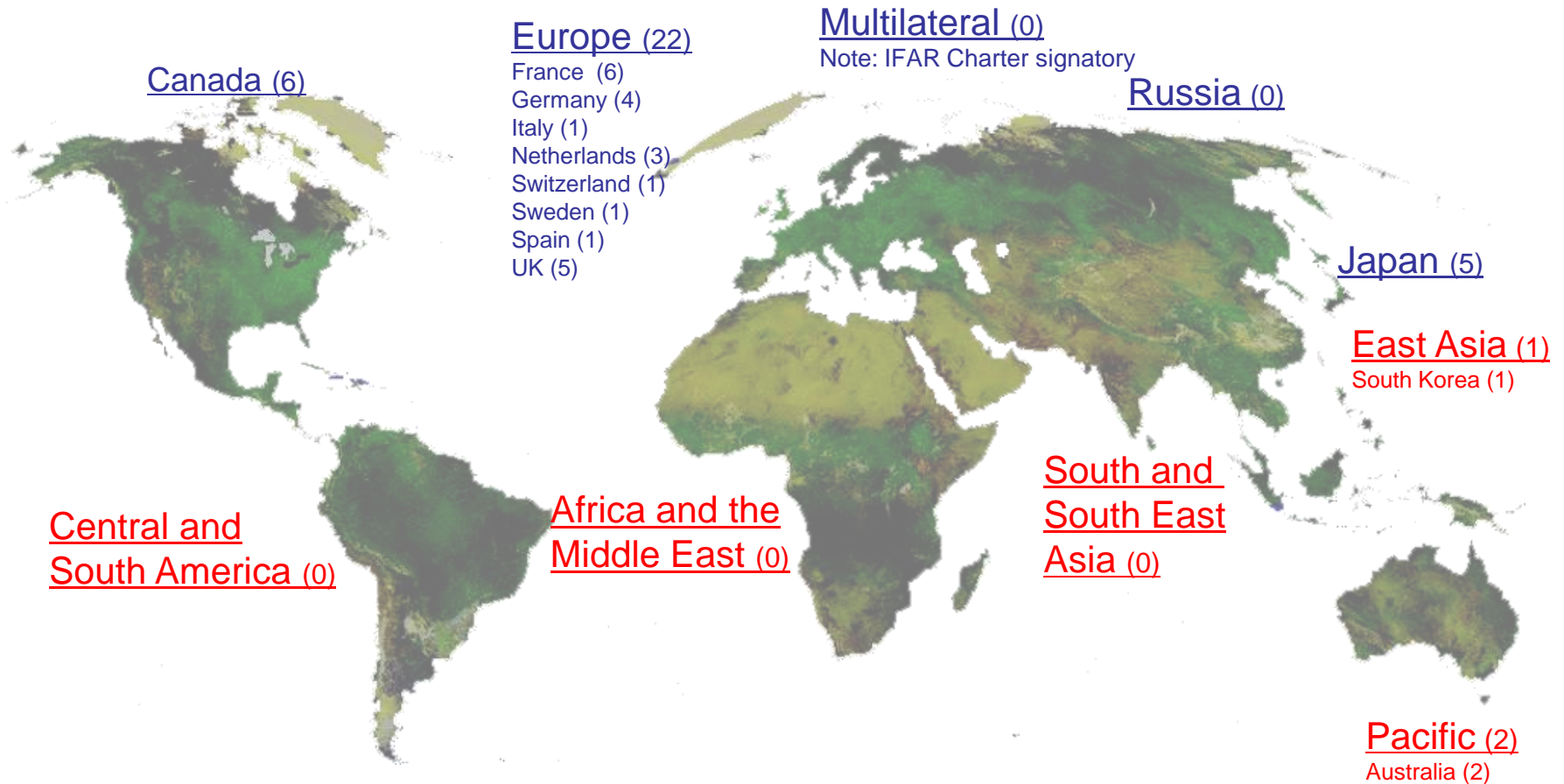
- Continue vetting the prospective Research Agenda with stakeholders and update to achieve a community wide view
 - Comments are being solicited from the Aeronautics Research and Technology Roundtable (ARTR) in early August
- Initiate a more detailed analysis of the Research Agenda to ensure clear need and priorities can be articulated. This could include detailed study by the National Academy
- Undertake a series of more detailed analysis and planning efforts for existing and new Research Thrusts

ARMD International Agreements

Agreements in force = 36 (out of 557 in agency)

Agreements/extensions in work = 10

mix of reimbursable and non-reimbursable agreements



ARMD International Collaboration

Evolution of ARMD international approach

- Adoption of a proactive, strategic approach to international collaboration.
- Enhanced engagement with international partners
- Program-level strategies for bilateral/multilateral engagement
- Formal leadership (AA level) engagement 1-2 times per year with key counterparts
- HQ management oversight of partnership engagement and strategic alignment

Global aeronautics Research and Development (R&D) environment

- European aeronautics R&D funding has become more coordinated and focused
- Enhanced interest in collaboration by Brazil, Russia, India, China (BRIC) and other non-traditional partners
- New capabilities of non-traditional partners
- Congressional prohibition on NASA collaboration with China

Strategic engagement considerations

- Venues like the International Forum for Aviation Research (IFAR) to engage with non-traditional partners on areas of common interest
- Careful consideration of collaboration vs. competition

Icing Research





High Ice Water Content (HIWC) research

- Global safety problem of engine icing characterized through international working groups
- NASA HIWC research activity to support FAA rulemaking and means of compliance
- Proactive engagement with international partners for unique contributions
 - NRC/Canada - icing expertise
 - Australia – geography, meteorology, and infrastructure
 - European Commission and Airbus for complementary research plans/investments, relevant data sources
- High level leadership discussions during formulation to inform general research strategies, identify possible areas of complimentary investments
- Bilateral agreements at technical level with each partner for unique contributions

NASA NextGen R&D Approach

Accelerate the Maturation and Implementation of Integrated NextGen Concepts and Technologies

Actively engage with industry (and FAA) on user validation of concepts

Define series of partnered integrated technology evaluations and demonstrations

ATM Tech Demo #1

ATM Tech Demo #2

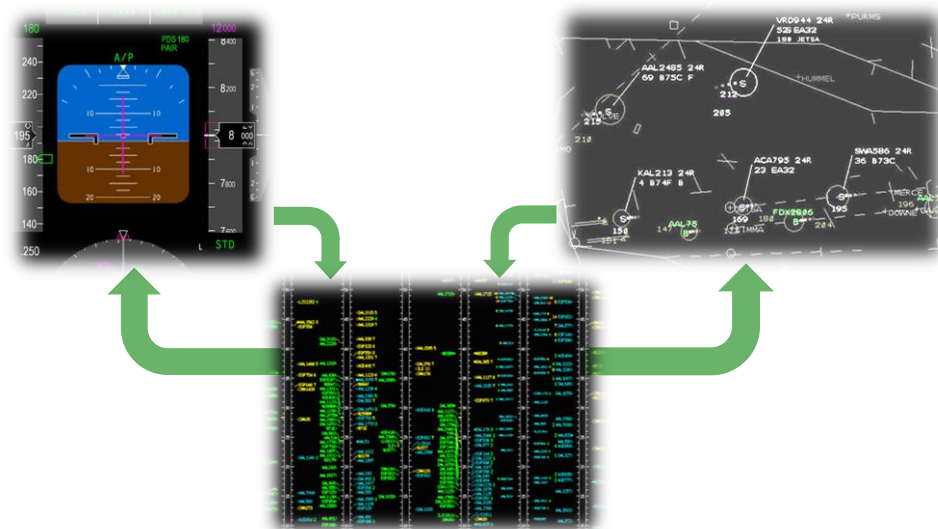
ATM Tech Demo #3

- 3-4 year time period for each integrated demonstration
- Staggered implementation enables regular delivery of transition products

Changing program's posture to move farther, faster in high priority areas

ATM Technology Demonstration 1: Objectives

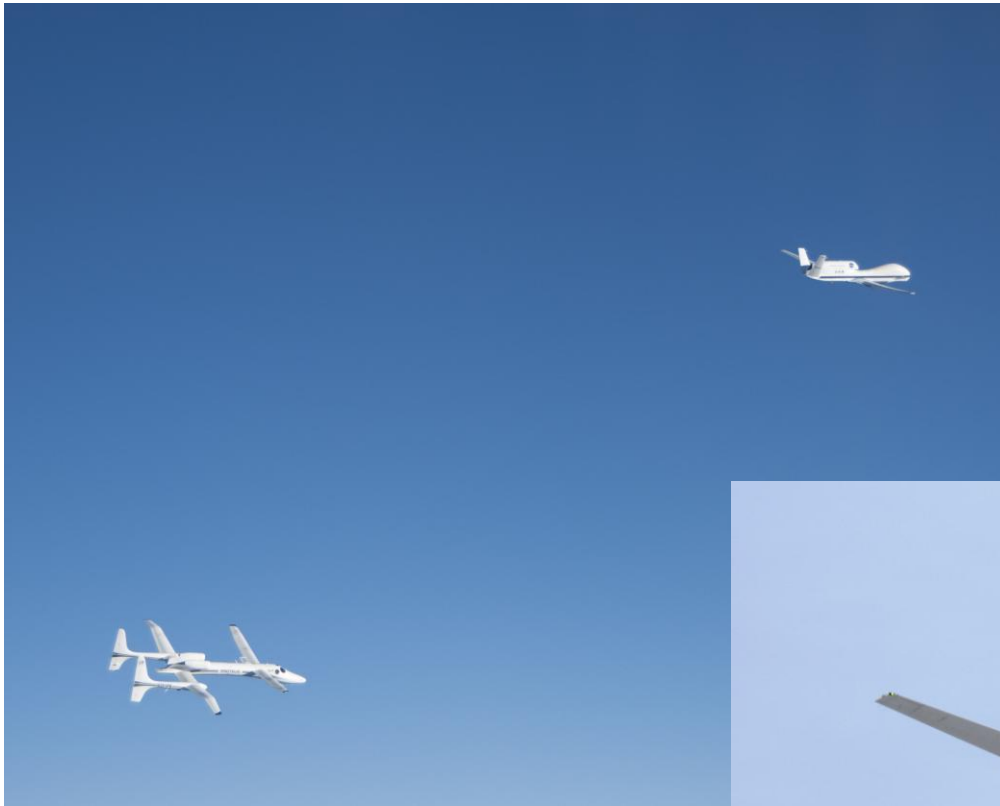
- Demonstrate increased, more consistent use of Performance-Based Navigation (PBN)
- Demonstrate ADS-B In Spacing Application
- Accelerate transfer of NASA scheduling and spacing technologies for inclusion in late mid-term NAS



Committee Finding

The Committee commends the strong coordination and collaboration between NASA and the Federal Aviation Administration (FAA) in air traffic management research. In particular, the Committee finds that the use of research technology transition teams (RTTs) by NASA and the FAA are a key component that enables NASA research to be integrated with stakeholder needs and facilitates the successful transition of research technologies into an operational environment. The Committee encourages NASA to continue to foster a strong collaborative environment with the FAA as it moves forward with plans for air traffic management technology demonstrations within the Airspace Systems Program.

UAV-to-UAV Refueling Demo



UAS Subcommittee

- Subcommittee established to review and assess NASA's approach and process on a wide range of UAS issues.
- Specific Objectives:
 - Provide advice and recommendations on overall objects, approach, content, and structure of UAS in the NAS project to ensure addressing relevant and compelling research needs
 - Review and evaluated the effectiveness of implementation for all critical, technical challenges in project plan and provide advice and recommendations for improvement
 - Provide assessments on types of and procedures for information and data transfer to and on strategic cooperation with stakeholders performing UAS-related development work in government and industry.

Subcommittee Members

- Dr. John Langford (Chair) Aurora Flight Sciences
- Ms. Rose Mooney Archangel Aero LLC
- Dr. Brian Argrow University of Colorado
- Dr. Eric Johnson Georgia Institute of Technology
- Mr. Nick Sabatini Nick Sabatini & Associates
- Dr. Steve Sliwa Morning Wings LLC
- Dr. Dave Vos (formerly Rockwell Collins)
- Ms. Lynn Ray FAA
- COL Dean Bushey US Air Force

General Impressions

- This topic has generated intense interest within the community. The number of public observers at both meetings to date has been high.
- The Committee strongly applauds NASA's re-entry in the field of unmanned air vehicles.
- Due to NASA's limited activity in this field over the past decade, the NASA technical team has of necessity spent considerable time re-learning the state of the art.
- The NASA program is strongly focused on in-house researchers and capabilities.

Major Discussion Topics

- Timeline of the Project relative to NextGen
 - Project set up with a finite timeline of 5 years; very different from traditional NASA Aeronautics projects
 - Project impact focused more on near term than on NextGen
 - Strong feeling that Project needs to be more or fully aligned with NextGen
- Autonomy
 - Concern that the Project is solely focused on only pilot on the loop type aircraft and not including more increased levels of autonomy
- Lack of Systems Engineering Function in Project
 - No apparent central systems engineering function to coordinated between subprojects

Committee Finding

The Committee is pleased that NASA ARMD is working to address the challenges of the integration of Unmanned Aircraft Systems (UAS) into the National Airspace System (NAS). Given the complex issues surrounding UAS, the Committee has found very valuable the work of the UAS Subcommittee which is able to delve into issues in greater depth with NASA staff. The Committee endorses the continued work of the Subcommittee and looks forward to further discussions between the Subcommittee and NASA.

In its review of the UAS Integration into the NAS project, the UAS Subcommittee reported that the project appeared to lack an overall systems engineering approach to addressing the challenges to UAS integration. This is a cause of concern for the Committee as it is important to handle the transition of integration of UAS into the NAS in a stepwise, systematic approach. The Committee strongly believes that the project needs to take a rigorous overall systems engineering approach to ensure that the right steps are identified and the activities within the project are better coordinated.

NASA IS WITH YOU WHEN YOU FLY

- Aligned with agency vision, mission and goals
- Guided by new strategic plan implemented in FY12
- Designed to improve awareness of fundamental research effort
- Focused on relevance of ARMD work to economic health of U.S. air transportation system



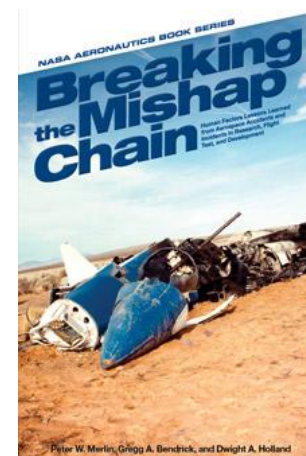
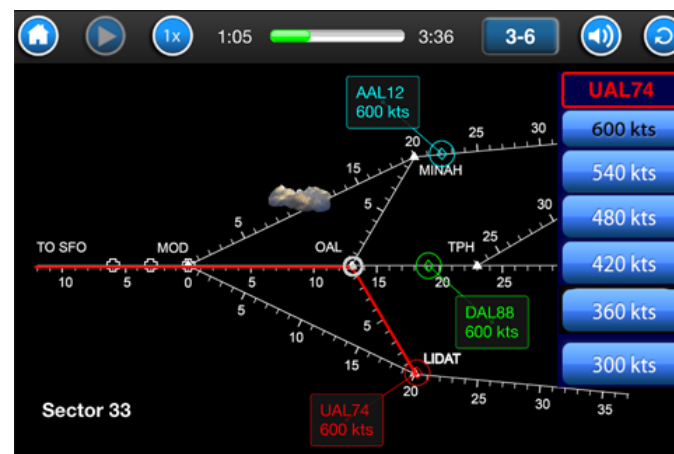
Communications: Highlight

NASA Aeronautics Day on the Hill – July 18, 2012

- 11 Congressional Members in attendance
- 7 – 8 professional staff from Senate Committee on Commerce, Science and Transportation
- ALL professional staff from House Committee on Science
- 206 Congressional staffers
- Supported by industry partners from Gulfstream, The Boeing Company, Lockheed Martin Aeronautics, GE Aviation, US Army Aeroflightdynamics Directorate , Pratt & Whitney

Education: 2012 Portfolio Highlights

- Aeronautics Scholarships prepares & assists Undergraduate/graduate students
- Aeronautics Academy provides hand-on research experience
- Design Challenges presents real-world problems
- K-12 STEM education materials
 - Smart Skies Sector 33 Air Traffic Control Application
 - <http://www.atcsim.nasa.gov/>
- Case Studies in Aeronautics
- Museum in a Box
 - Hands on activities for classroom/science centers



Committee Finding

The Committee notes and applauds NASA's proactive Education and Outreach initiatives. We note , however , that the Aeronautics programs are not frequently prominently featured or highlighted in these initiatives . The general public and NASA could benefit from understanding the scope and depth to which the Aeronautics activities at NASA contribute to the nation's aviation economy.